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# UNLEASHING MANUFACTURING EXCELLENCE:

# LEVERAGE MACHINE TOOL MONITORING FOR OPTIMAL PERFORMANCE

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# THE CRUCIAL ROLE OF DATA COLLECTION

In machining, the importance of data collection cannot be overstated, as it transforms raw operational data into actionable insights. This process involves capturing a wide range of information generated by CNC machines during their operation, which can be classified into several key areas:

## Machine Status

This area provides insights into the operational state of a CNC machine at any given moment, indicating whether it is actively machining, idle, or undergoing maintenance. Real-time understanding of machine status enables more efficient scheduling and resource utilization, ensuring that machinery is not idle when it could be productive, or that necessary maintenance is performed to prevent unexpected breakdowns.

## Process Parameters

These include essential operational data such as spindle speed, feed rate, cutting tool details, and other specific parameters governing the machining process. By monitoring these parameters, manufacturers can optimize the machining process for speed, efficiency, and material usage, resulting in cost savings and improved throughput.

## Part Metrics

This aspect focuses on the quality and accuracy of the parts being produced, including measurements of dimensional accuracy, surface finish, and any deviations from predefined specifications. Monitoring part metrics closely is crucial for maintaining high product quality standards and minimizing waste due to defects or rework.

## Power Consumption

Tracking the energy usage of CNC machines provides valuable insights into the overall efficiency of the manufacturing process. It can identify machines that are consuming excessive energy, possibly due to inefficient operation or the need for maintenance, offering opportunities to reduce costs and minimize the environmental impact of manufacturing.

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# BENEFITS OF STRATEGIC DATA COLLECTION

## Optimizing Production Flow:

Identifying and addressing production bottlenecks streamlines operations, reduces cycle times, and increases output. Data-driven adjustments to process parameters enhance the efficient use of machinery and materials.

## Implementing Predictive Maintenance:

By applying predictive analytics to the data collected from machine tools, potential equipment failures can be forecasted before they occur. This proactive maintenance approach significantly reduces downtime, associated costs, and the risk of unfulfilled orders due to machine failure.

## Maintaining Product Quality:

Real-time data monitoring allows for the early detection of deviations from quality standards, enabling immediate corrective actions. This ensures that the final product consistently meets or exceeds customer expectations, enhancing brand reputation and customer satisfaction.

## Enhancing Operational Decision Making:

Equipped with comprehensive and accurate data, managers and decision-makers can make more informed choices regarding production scheduling, resource allocation, and process improvements. This leads to a more agile, responsive, and efficient manufacturing operation capable of adapting to changing market demands and challenges.

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# DATA COLLECTION TOOLS: SPLUNK EDGE HUB

Splunk's Edge Hub device enables rapid deployment at the machine level, offering the ability to connect and analyze data from CNC machines and other tools that have historically been hard to reach.


The Edge Hub can interface with existing machine controllers, deploy edge computing, and push machine performance and condition data into analytic platforms, such as Splunk Enterprise.. It's built in sensors provide additional context, such as environmental conditions, which can help correlate with machine issues. This capability is crucial and allows us to connect to more machines, capture more operational data, and deliver deeper insights into machine performance and maintenance.

- **Seamless integration of edge data.**
- **Faster time to action, make data driven decisions.**
- **IP66 rated for use in industrial settings.**
- **Native protocol support, MQTT, SNMP, MODBUS, OPC-UA.**
- **Built in Sensors, Light, Sound, Humidity, Temperature, and more.**
- **Multiple connection types, WIFI, LTE, Bluetooth, Ethernet.**
- **Edge AI capabilities, performed on the device before being sent to the platform.**

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# DATA COLLECTION TOOLS: SHARC IOT SENSOR ADAPTER

The SHARC IoT sensor adapter is designed to stream data from industrial sensors via the MQTT protocol. The A-coded five-pin M12 connector accepts PNP, NPN, 0-10 V and 4-20 mA signal inputs in a single channel. The SHARC and sensor can be powered with Power-over-Ethernet (PoE) or an existing 24 Vdc supply. Data is transmitted to the Edge Hub over wired Ethernet, Wi-Fi or Bluetooth.


A range of onboard configurable signal processing options accommodates encoder inputs, counters, switches and scaling of analog signals, allowing simple integration into Splunk. The combination of Edge Hub and SHARC is the quickest method of collecting observations in the real world.

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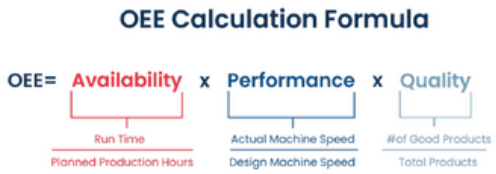
# OEE

In the fast-paced world of manufacturing, efficiency is key to success. One of the most powerful tools for measuring and improving efficiency is Overall Equipment Effectiveness (OEE). OEE provides manufacturers with valuable insights into how well their equipment is performing relative to its maximum potential. In this blog post, we'll explore what OEE is, why it's important, and how manufacturers can get started with monitoring their machine tools to drive operational excellence.




## Understanding Overall Equipment Effectiveness (OEE)

OEE is a metric used to evaluate the efficiency and productivity of manufacturing processes by measuring the performance, availability, and quality of equipment. It is calculated by multiplying three factors:

1. Availability: The percentage of time that equipment is available for production.
2. Performance: The speed at which equipment operates compared to its maximum capacity.
3. Quality: The percentage of good-quality products produced relative to the total output.

By combining these factors, OEE provides a holistic view of equipment performance and highlights areas for improvement.

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# IMPORTANCE OF OEE IN MANUFACTURING

## Identifying Losses:

OEE exposes various types of losses, including downtime, speed losses, and defects, which hinder productivity and profitability. By pinpointing these losses, manufacturers can take targeted actions to minimize or eliminate them, thereby maximizing overall equipment effectiveness.


## Driving Continuous Improvement:

OEE acts as a catalyst for continuous improvement initiatives by providing a baseline for measuring progress and setting performance targets. By regularly monitoring OEE metrics and implementing corrective actions, manufacturers can incrementally enhance efficiency and optimize production processes.


## Optimizing Resource Allocation:

1.OEE enables manufacturers to allocate resources more effectively by identifying bottlenecks, inefficiencies, and underutilized capacity. By reallocating resources to high-impact areas and streamlining workflows, organizations can optimize resource utilization and enhance overall productivity.

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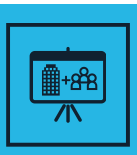
# LEVERAGING OEE FOR OPERATIONAL EXCELLENCE

To leverage OEE effectively, manufacturers can adopt the following strategies:

## Implement Real Time Monitoring

Utilize advanced monitoring systems and sensors to track equipment performance in real-time. This enables proactive identification of issues and timely intervention to prevent downtime and improve OEE.



## Set Clear Performance Targets:

·Establish ambitious yet achievable OEE targets aligned with organizational goals. Communicate these targets to all stakeholders and incentivize performance improvements to foster a culture of continuous improvement.

## Invest in Training and Skill Development:

Provide comprehensive training programs to equip employees with the knowledge and skills necessary to maximize equipment performance and minimize downtime. Empower teams to troubleshoot problems independently and implement preventive maintenance measures.

## Utilize Data Analytics:

Leverage data analytics tools to analyze OEE metrics, identify trends, and uncover root causes of inefficiencies. By harnessing actionable insights from data analytics, manufacturers can make informed decisions and prioritize improvement initiatives for maximum impact.

## Embrace Lean and Six Sigma Principles:

Apply lean manufacturing and Six Sigma methodologies to eliminate waste, reduce variability, and streamline processes. By adopting principles such as continuous flow, standardized work, and visual management, organizations can enhance OEE and drive operational excellence.

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# ABOUT 6IX FOR MACHINE TOOL OPERATIONS

SIX MTO
MACHINE TOOL OPERATIONS

SMS's 6IX for Machine Tool Operations (MTO) is an advanced solution for monitoring machine tools, like Lathes, Milling Machines and many more. MTO uses Splunk Edge Hub to monitor production rates, factory performance, as well as equipment health to provide production visibility, improve manufacturing processes, and reduce unplanned downtime.

## CONCLUSION

Monitoring Machine Tools and applying Overall Equipment Effectiveness (OEE) are powerful tools for manufacturers seeking to optimize performance, maximize efficiency, and achieve operational excellence.

By understanding the components of OEE, recognizing its importance, and implementing strategies to leverage data from their machine tools effectively, manufacturers can unlock significant improvements in productivity, quality, and profitability. As manufacturing operations become increasingly complex and competitive, harnessing the full potential of OEE is essential for staying ahead of the curve and thriving in today's dynamic business environment.